Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

vated solid," prepared by the original method, adequate protection usually required doses between 0.1 and 0.2 gram. This, taken in connection with the lower nitrogen content and absence of adenine is ample evidence of the greatly improved character of the "activated solid" prepared by the new method.

HAY-FEVER PLANTS OF CALIFORNIA.

By HARVEY MONROE HALL, B. S., M. S., Ph. D., formerly head of the Department of Botany, University of California; Member California Academy of Sciences.

1. PURPOSE OF THE PAPER.

The purpose of the present paper is to assist the members of the medical profession in determining the specific causes of hay fever in their respective districts. The lists here presented are intended to include all of the more important hay-fever plants of California. It is hoped that with the aid of the notes accompanying the catalogue the specialist can inform himself as to the plants that are the most frequent causes in his particular locality. The pollen or pollen extracts of these species may then be obtained and used in skin-reaction tests. In this manner the exact botanical species responsible for the hay fever of the individual may be determined, assuming that the symptoms are not due to some cause other than pollen. The final procedure is the desensitization of the patient through the use of the extracts to which positive reactions have been obtained, this treatment preferably to precede the period of pollination.

The lists here assembled and the principles used in the selection of species are the result of field studies in all parts of the State, extending over a long period of time. In recent years special attention has been given to plants as causes of hay fever, and there has been frequent opportunity for consultation with practicing specialists. The author is especially indebted to Dr. Grant Selfridge of San Francisco, who first called his attention to the subject, and the results of whose studies have been freely available throughout this period. Reports on the results of skin-reaction tests have been submitted also by the following: Dr. William P. Scheppegrell, president of the American Society for the Prevention of Hay Fever; Dr. Charles T. Chamberlain, Portland, Oreg.; Dr. George Piness, Los Angeles, Calif.; Dr. Albert H. Rowe, Oakland, Calif.; and Dr. Samuel H. Watson, Tucson, Ariz. Their findings have been incorporated into the present paper in so far as they apply to Californian plants. The author's thanks are due to these specialists and to many others, both in California and in the Eastern States, for helpful data and advice.

2. PRINCIPLES USED IN THE DETECTION OF HAY-FEVER PLANTS.

The lists here presented have been prepared almost exclusively from the botanical point of view. This is done because it is found in practice that the first requisite in locating the causes of hay fever, and consequently in determining the method of treatment, is a knowledge of the plant species that produce an abundance of wind-carried pollen during the season of attack. It should be remembered, however, that albuminous substances other than pollen sometimes produce the disease. The most frequent of these are animal dandruff, toilet powders of vegetable origin, foods, etc. Such factors are not here included. Certain well-established biological principles are used as a guide in the carrying out of any hay-fever survey. These principles were employed in the preparation of the following lists, and may be enumerated as follows:

1. All important hay-fever plants are anemophilous; i. e., their pollen is distributed by the wind. As a result of adaptation to wind pollination, the flowers are much reduced in size, and are never showy nor provided with nectar glands. Conversely, any plant with conspicuous or highly colored blossoms, and any that secretes nectar or is otherwise developed for the attraction of insects, may be excluded from the lists. Through the application of this principle alone the great majority of plant species is at once removed from consideration and the work much simplified in consequence. Among the numerous plants popularly supposed to cause hay fever, but which are now known to be of very minor importance, if any, because of their adaptation to insect pollination, are locust, goldenrod, roses, sunflower, dandelion, and all of the common fruit trees. The only qualification that need be made to the general statement that entomophilous (i. e., insect-pollinated) plants are innocent, is that they may sometimes produce hay-fever symptoms by direct inhalation, as when carried in bouquets. Even in the few supposedly authentic reports of such cases, it is not impossible that the effect was due to foreign pollen carried by the plants, or to impurities in the pollen extract used in making the tests. The more frequently reported entomophilous species are here indicated in a supplementary list.

2. Certain botanical groups are seldom causative factors, even though anemophilous. This statement is based not upon botanical grounds but upon the results of numerous tests with the pollen extract. The subject is one which is sadly in need of exact scientific experiment. The two principal groups commonly excluded on these grounds are the pines (genus *Pinus*) and the sedges (genus *Carex*). Although numerous tests have been made with pine pollen, only one positive reaction has been reported, and even the authenticity of this has been doubted by some. One species of

juniper (*Juniperus virginiana*), commonly called red cedar, which belongs to the pine family, is said to be occasionally a cause, but no positive records have as yet been obtained for cypress or other allies of the pine and juniper. The sedges comprise a very difficult group of numerous species, and it is hoped that their present record will be maintained. They are grasslike in superficial appearance, but sufficiently distinct from the Gramineae, or grass family, in botanical characters to indicate the probability of fundamental differences in the proteid content of their pollen. Even though the sedges may occasionally be the cause of hay fever, the fact that they seldom grow in abundance near cities renders them of only minor importance. While both the pine and the sedge group should be kept in mind, their importance is not such as to justify their serious consideration except in cases where all other tests yield but negative results.

3. Only those species which are fairly abundant in settled districts need be included in the lists. Therefore the plants which grow in remote mountain or desert regions, or which occur only as scattered individuals or in small colonies, are not here included. The addition of such cases would so greatly swell the list as to render its use impracticable. This principle should be especially borne in mind when testing patients who live in out-of-the-way places, since the cause may be found to be some plant common in the vicinity of the sufferer, but not generally distributed and hence not enumerated. Sometimes, too, the cause will be found to be some unusual plant grown for food or ornament near the patient's home or place of business. This applies particularly to city and suburban dwellers. Such causes can be located only by a close botanical survey of the immediate vicinity, or by examining for other factors than plant pollens.

4. Skin reactions obtained by testing with an extract prepared from the pollen of the plant itself is the final criterion used in forming judgment as to whether or not a suspected species is a cause of hay fever. This presupposes the use of extracts prepared from carefully collected pollen that has been examined microscopically as to its purity and that has been identified by a competent botanist after examination of a specimen plant from which the pollen was obtained. Neglect in this matter has sometimes led to the report that certain species were causative factors, whereas the actual cause of the positive result obtained in the test was the presence of some foreign substance, usually the pollen of some other species which had been unwittingly included in collecting the sample. The absence of positive results in the tests does not necessarily indicate that the species is innocent, but only that it is not the cause in the case of the subjects tested. Perhaps, on further experiment, other patients will be found

who, being sensitive to the specific pollen under consideration, will react to it in a positive way.

5. The size and weight of the individual pollen grain determines to some extent the potential area of the various species. The size of the mature grains is practically constant for any given kind of plant. When the diameter falls below about 20 microns the pollen is easily carried to considerable distances. The common eastern ragweeds, with pollen diameters of about 15 microns, belong to this class; whereas the western ragweed (*Ambrosia psilostachya*), with a pollen diameter of 25 microns, is a factor only when it grows close to places of habitation or during strong winds. Indian corn, or maize, has a very limited potential area because of the very large size of the pollen, which measures 80 microns in diameter. The only people affected are those who have occasion to work in the cornfields during the pollinating season and who are sensitive to this particular kind of pollen. The California black walnut must be classed as of small potential area because of its fairly large pollen; yet it is exceedingly important as a hay-fever plant because of its abundance in certain districts where it is grown in yards, streets, and parks for shade and ornament. The pollen sifts down in great abundance in the spring of the year and seriously affects many people living in the immediate vicinity.

3. ARE SPECIFIC POLLENS ESSENTIAL?

A satisfactory answer to this question has not as yet been given. The original idea that any species of pollen would suffice for any case of pollinosis has given way to the demonstrated principle that pollen of one large group of plants can not be successfully used either for testing or for treatment of hay fever caused by the pollen of another group. The important questions now are, How small must these groups be? and, Do they correspond to the taxonomic groups of the botanist? This subject calls for much more careful and scientifically accurate experimental evidence than has been thus far adduced. It is not improbable, for example, that some of the cases reported of immunization obtained for one species were really due to the presence in the extract used of proteins from an entirely different pollen which had been unintentionally mixed in in the process of collecting. This mixing is especially likely to occur in the case of meadow grasses. Sometimes, too, the pollens have been wrongly identified, or the use of common names has led to confusion. Finally, it must be admitted that the botanists' "species" are not all of the same rank. In the genus *Artemisia*, for example, the tendency to recognize "small species" has become so great that many of the segregates are not species in the old sense, but forms, the chemical constitution of which is probably in many cases identical with that of other forms. It is therefore apparently necessary to work on the basis of larger species, perhaps with groups of species, or even larger units. If this is found to be a safe method, much time, expense, and confusion may be avoided by ignoring the smaller taxonomic units, sometimes called species. A knowledge of the degree of relationship between different plants will often be of much service.

Thus it is seen that until such time as exhaustive experiments can be carried out between the specialist, the biochemist, and the botanist, the only safe procedure is to test and treat with specific pollens except in those cases where one's own experience dictates a different course. In the present paper a rather large and therefore conservative species concept has been adopted, but the smaller species or varieties within these larger species are also mentioned in most cases.

4. SUGGESTIONS REGARDING THE SECURING OF PURE POLLEN.

At the present time it is impossible to secure from the commercial drug houses more than a very few of the pollens needed for testing and treatment of hay fever in the West, and the few to be had are sometimes incorrectly named or impure. It is hoped that the increasing demand will soon justify a few concerns in proceeding with the collection and preparation of authentically named pollens of all the more common species. It is of the highest importance that the pollen (or its extract) of each species be obtained separately, since mixtures from different species permit neither of specific testing nor of treatment with only the specific pollens that cause the trouble. Until such time it is necessary for each specialist to arrange for his own supply. Trouble and expense are both reduced when exchanges are arranged or when several specialists unite in employing the same collector.

The number of species necessary for the work varies greatly with the locality and with the size of the area from which the patients come. While preliminary studies and even treatments may begin when only a limited number are available, it will be found unsatisfactory to proceed in an authoritative way until most of the important ones have been assembled. The attempt to practice with a limited assortment is responsible for many of the failures to obtain complete desensitization.

The chief requirement in the collection is an accurate identification of the plant. In all cases, no matter how authoritative the collector, an herbarium specimen should be taken. If this and the pollen are assigned the same number, the specimen will always serve as a voucher in case the accuracy of the identification of the pollen is called in question.

The actual collection of the pollen is a tedious but not especially difficult undertaking. The easiest method for plants like walnut, cottonwood, hazel, etc., that bear their flowers in catkins, is to gather these just as the stamens are opening, spread them out on glass plates or oiled paper in a warm room, and tap the pollen out as it matures; a safety-razor blade and a business card are convenient for gathering up the pollen, which should be cleaned by passing it through silk bolting cloth of the finest mesh obtainable. Small embroidery rings will be found convenient for holding the cloth. Most species, however, require more detailed attention. These are usually gathered in the form of bouquets and the flowers placed in a warm, closed room until the pollen sheds. The bouquets themselves may be set in their containers directly on the glass or paper, or they may be gently lifted from time to time and the pollen tapped out. It is sometimes advisable to use a nutrient solution, such as the one described by Selfridge.[1] This is especially effective with many of the grasses. Special methods will have to be devised in some cases. It will be found also that certain species, particularly of the grasses, pollinate only at regular daily periods, these usually falling in the early morning hours.

Whatever the method of collection, the purifying by means of bolting cloth and, above all, accurate identification and the preservation of an herbarium specimen of each species are matters to be insisted upon. All implements used, especially the sieves, should be thoroughly cleansed when changing from one species to another.

5. HOW TO USE THE LISTS.

All of the genera and species are arranged in alphabetical order under their botanical names, with the exception of a few entomophilous plants of minor importance, which are enumerated at the end of the list. The family name is given in each case, so that all of those belonging to any one group may be assembled if this is desired. The common, or English, names are given in the list and indexed at the end. However, many species of native plants have not as yet been christened with generally accepted English equivalents. Each entry is numbered in the hope that this enumeration will serve as a handy check list. Later insertions may be indicated by the use of letters.

Species of special importance are indicated by an asterisk (*). Relative importance has been determined by field observations as to the abundance of the plants, by the amount and size of the pollen produced, and by reports as to the frequency and extent to which positive results have been obtained in testing with the extracts. This classification will undoubtedly require considerable modification as the work progresses. It should be remembered also that relative importance varies greatly with locality. A species of first rank in one district may be of minor significance in another, and vice versa. It therefore behooves the practitioner to scan the list carefully, looking for species which, although not starred, may be especially common in his neighborhood. The assistance of local botanists of repute should be obtained wherever possible, since this will greatly aid in the making up of special lists. It is also suggested that intensive local botanical surveys be made for special cases which do not yield to the tests suggested by the present lists nor to tests with proteid substances other than plant pollens.

---

[1] The Laryngoscope, October, 1920, p. 613.

It is desirable that the list be reduced for any particular locality by elimination of the entries of those species which grow only in other parts of the State. As an aid toward this, special lists have been prepared for the more densely populated districts, namely, San Francisco Bay communities, the Sacramento and San Joaquin Valleys, and the Los Angeles-Pasadena district. In order to conserve space, these special lists have been reduced to the numbers under which the names will be found in the main list. It must be remembered, however, that these local enumerations aim to include only the more important species. The entire series should therefore be considered when working with especially elusive cases. Those operating outside of the special districts mentioned will need to utilize the main list, eliminating those plants known to be absent from their locality.

With the select lists made up for any given locality, the next step is to arrange the species into seasonal groups. Spring, summer, and autumn are suggested. But it must be remembered that the date of blossoming varies somewhat from year to year; also that rains at unusual periods may induce some plants to blossom out of season. At best there will be considerable overlapping, so that many species will need to be entered on two or even all three of the seasonal lists. When the cause can not be located among the plants for the season selected, the more important ones for the season immediately following or immediately preceding should be given a trial.

6. LIST OF HAY-FEVER PLANTS OF CALIFORNIA.[1]

1. AGROPYRON TENERUM. Slender Wheatgrass. Grass Fam. Common only in the mountains, but occurs also at such places as Yreka, Eureka, and Woodland. May-June and into August in the mountains. Related species give positive tests.

2. AGROPYRON, species. Wheatgrass. Grass Fam. Several of these summer-flowering grasses are found in addition to No. 1, but they are restricted to rather sparsely settled districts in the mountains and to the northernmost counties; should be considered at such places as Truckee, Sierra, and Honey Lake Vals., and in Siskiyou and Modoc Cos. The principal species are *A. repens* (rare) (Quackgrass or Couch-grass) and *A. caninum.*

---

[1] Asterisk (*) indicates species of special importance. The following abbreviations are used in the list: Calif. for California; Co. for County; Fam. for family; Val. for valley; after "Positive," C. for Chamberlain; P. for Pinoss; R. for Rowe; Sc. for Scheppegrell; Se. for Selfridge; and W. for Watson.

*3. AGROSTIS ALBA (=*A. palustris*). Redtop. Grass Fam. A common pasture and meadow grass of northern Calif.; southward only in the mountains. A frequent cause of hay fever in northwest America and in the Eastern States. June-September. Positive: C., P., Sc., Se., W.

4. AGROSTIS EXARATA (= *A. asperifolia*). Grass Fam. Moist places in the mountains; also occasionally plentiful in the moist coast districts; Monterey, Ukiah, Fort Bragg, Humboldt, etc. Summer.

5. AGROSTIS VERTICILLATA (=*A. stolonifera*). Grass Fam. Along ditches and in other moist places in the warmer districts; important only in southern Calif., where it is common on irrigated land. Spring, summer.

6. AGROSTIS, species. About 15 other sorts occur in the State but mostly as scattered growth.

7. AIRA CARYOPHYLLEA. Grass Fam. A small grass, common on open hills the full length of the State; absent from the desert. Spring. Positive: Sc.

8. ALNUS OREGONA (= *A. rubra*). Red Alder. Birch Fam. Restricted to proximity of the coast from Santa Barbara Co. north. Very closely related to the preceding species. February-April. Positive: C., R.

9. ALNUS RHOMBIFOLIA. White Alder. Birch Fam. A tree restricted to stream banks in the hills, therefore of only local significance. January-March.

10. AMARANTHUS GRAECIZANS. Tumbleweed. Amaranth Fam. Throughout the State, but abundant only in old fields and orchards. Other plants, especially Russian Thistle, are often called Tumbleweed. July-October. Positive: P., Sc., Se.

*11. AMARANTHUS RETROFLEXUS. Rough Pigweed. Amaranth Fam. Barnyards and neglected fields; common around towns. A coarse weed with abundant pollen in the morning. July-October. Positive: C., P., Sc., Se.

*12. AMBROSIA PSILOSTACHYA. Western Ragweed. Composite Fam. General throughout the State, especially on low land and in waste places. Potential area restricted by large size of the pollen grains, which measure about 25 microns in diameter. July-October. Positive: C., P., R., Sc., W.

13. AMBROSIA PUMILA. Dwarf Ragweed. Composite Fam. Known only from the vicinity of San Diego. May-June, as far as known. Positive: P.

14. AMMOPHILA ARENARIA. Beachgrass. Grass Fam. Restricted to the sand dunes along the coast from San Francisco northward; abundant in Humboldt and Del Norte Co. Summer. Positive: P.

*15. ANDROPOGON HALEPENSIS (=*A. sorghum* var. *halepensis*, *Sorghum halepense*, and *Holcus halepensis*). Johnson grass. Grass Fam. In moist places of the warm interior districts, especially the Sacramento and San Joaquin Vals.; also near Pomona and Los Angeles. A most important grass where it occurs. May–August. Positive: C., P. Sc., Se., W.

16. ANDROPOGON SORGHUM SUDANENSIS. Sudan grass. Grass Fam. An agricultural grass much grown in warm places. So closely related to Johnson grass that the possibility of using the pollen interchangeably should be tested. July–August. Positive: P., Se.

17. ANDROPOGON SORGHUM vars. Kaffir Corn, Egyptian Corn, Milo Maize. Grass Fam. All of these are cultivated extensively in warm interior valleys. Each is a distinct race or variety, but all are members of a single species. Summer. Positive: P., Sc.

18. ANTHOXANTHUM ODORATUM. Sweet Vernal grass. Grass Fam. Only in the cool, moist districts, such as Humboldt and Del Norte Cos.; common only when grown as a meadow grass. May–July. Positive: C., P., Sc.

19. ARISTIDA, species. Triple-awn grass. Grass Fam. Nine species occur, mostly in the warmer and drier parts of the State; none abundant unless locally. Spring.

20. ARTEMISIA BIENNIS. Biennial Wormwood. Composite Fam. Introduced and local. Occurs abundantly as a weed in waste places near towns, as at Berkeley. August–November. Positive: Sc.

*21. ARTEMISIA CALIFORNICA. Coast Sagebrush. Composite Fam. Coast Range only, but there abundant from San Francisco Bay to San Diego. This is not the true Sagebrush of the interior (*Artemisia tridentata*), and the pollens are not equivalent. August–October., but often blossoming out of season. Positive: P., Sc., Se.

22. ARTEMISIA CANA. Hoary Sagebrush. Composite Fam. Only in the northeastern part of the State, especially around Truckee; scattered, on stony slopes. August–November.

23. ARTEMISIA DRACUNCULUS (=*Aromatica* and *A. dracunculoides* of some authors). Dragon Sage. "Indian Hair Tonic." Composite Fam. Common only in the mountains, e. g., Truckee, San Bernardino Mountains, San Jacinto Mountains; also local at Los Angeles, Haywards, and along coast. July–November. Positive: Sc., Se.

24. ARTEMISIA PYCNOCEPHALA. Composite Fam. Only on coastal sand dunes from Monterey Co. north and on the easterly side of San Francisco Bay. Nowhere abundant. June–September.

25. ARTEMISIA SPINESCENS. Bud-sage. Composite Fam. East of the Sierra Nevada only; Mohave Desert from Hesperia and Lancaster north across Owens Val, to Oregon. March–June. Positive: Sc.

*26. ARTEMISIA TRIDENTATA. Sagebrush. Composite Fam. Abundant in the Great Basin, where it is the chief cause of "mountain fever," but occurs in Calif. only to the east of the Sierra Nevada and on areas adjacent to the desert in southern Calif.; common from Newhall to Piru, Ventura Co.; west as far as Coahuila and El Campo, in Riverside and San Diego cos. August–November. Positive: P., R., Sc., Se., W.

*27. ARTEMISIA VULGARIS (including as varieties or synonyms *A. hookeriana*, *A. heterophylla*, *A. suksdorfi*, *A. ludoviciana*, and *A. gnaphalodes*). Mugwort. Sagewort. Composite Fam. Abundant throughout the State, especially on low lands, but also in the hills. The most frequent cause of the fall type. The several varieties enumerated are all so closely similar in botanical features that any difference in the pollen seems improbable. Until this point is definitely determined it is better to use extracts prepared from the particular variety present in the neighborhood. For most parts of Calif. this is subsp. *heterophylla*, which is the same as *A. heterophylla* July–November. Positive: C., R., Sc., Se.

28. ARUNDINARIA FALCATA. Grass Fam. Commonly grown as an ornamental, especially in western middle Calif. *A. falcata* is the name commonly used for these plants, but there is some doubt as to the accuracy of the identification. Summer. Positive: Se.

29. ARUNDO DONAX. Giant Reed. Grass Fam. Commonly cultivated for windbreak or ornament; interior valleys, especially from Stockton to Modesto; San Francisco Bay region; southern Calif.

30. ATRIPLEX ARGENTEA (including subsp. *expansa* and also *A. mohavensis* and *A. trinervata*). Silverscale. Saltbush. Chenopod Fam. Alkaline districts of interior valleys and of southern Calif. Mostly June-July, but some plants pollinating in moist places as late as October. Positive: C. Se.

*31. ATRIPLEX BRACTEOSA (*A. serenana*). Bractscale. Chenopod Fam. Alkaline areas of the interior only; throughout the Sacramento and San Joaquin Vals.; southern Calif. only on alkaline lands, especially in Orange County. Mostly summer, but some plants pollinating as early as April, others as late as October. Positive: P.

32. ATRIPLEX CANESCENS. Chenopod Fam. Chiefly of the desert area east of the mountains; occasionally on the coastal slope from Ventura to San Diego. May–September. Positive: W.

33. ATRIPLEX CONFERTIFOLIA. Spiny Saltbush. Chenopod Fam. Mohave Desert north through Owens Val. to Oregon line; also at a few places along the west side of the San Joaquin Val. as far north as Dos Palos. May–August.

34. ATRIPLEX HYMENELYTRA. Desert Holly. Chenopod Fam. Colorado and Mohave deserts north to Owens Val. Not found west of the mountains. February–April,

35. ATRIPLEX LENTIFORMIS (including *A. breweri* and *A. orbicularis*). Lenscale. Quailbrush. Chenopod Fam. From the alkaline districts of the upper San Joaquin Val. to both deserts, but especially abundant on the Colorado; also along the coast (form=*A. breweri*) from Santa Barbara to Capistrano. June–October.

36. ATRIPLEX PATULA (including var. *hastata*). Spearscale. Fat-hen. Chenopod Fam. Abundant in salt marshes along the coast and in alkaline soils of the interior, running into many forms and races. August–September. Positive: Sc.

37. ATRIPLEX POLYCARPA. Allscale. Chenopod Fam. Alkaline districts of the San Joaquin Val. from near Stockton south; common around Bakersfield and on the Colorado and Mohave deserts, and north to Inyo Co. Summer–autumn.

*38. ATRIPLEX ROSEA. Redscale. Red Orache. Chenopod Fam. An introduced weed becoming abundant in the interior vals. and in southern Calif. August–September. Positive: Se.

39. ATRIPLEX, miscellaneous species. Less important than any of the foregoing Atriplexes are the following, some of which may be occasional factors in alkaline or saline districts: *A. californica*, *A. cordulata*, *A. coulteri*, *A. fruticulosa*, *A. leucophylla*, *A. microcarpa*, *A. parishi*, *A. phyllostegia*, *A. semibaccata*. *A. leucophylla* and *A. microcarpa* are especially common on the coast of San Diego Co.

40. AVENA BARBATA. Grass Fam. Less common than No. 41, but sometimes covering considerable areas in the coastal districts; also in moist places in the interior. Only slightly different from *A. fatua* in botanical characters and perhaps there is no need of distinguishing them in hay-fever work. Spring.

*41. AVENA FATUA. Wild Oat. Grass Fam. Extremely abundant in coast counties, extending the full length of the State; less common in the interior. Spring. Positive: C., P., R.

*42. AVENA SATIVA. Cultivated Oat. Grass Fam. Grown in northern Calif. and escaping along fields and roadsides. It has not yet been determined whether the pollen of these three species of oat may be used interchangeably. Spring. Positive: C., Sc., Se.

43. BETA VULGARIS. Beet. Chenopod Fam. Much grown for sugar, especially in the Sacramento, San Joaquin, Salinas, Owens, and Antelope Vals. and in Ventura Co.; also in vegetable gardens. The plants are mostly harvested before flowering. Spring, summer, fall.

44. BETULA ALBA. White Birch. Birch Fam. A common street tree. Several varieties are planted. A form sometimes called *B. occidentalis* grows sparingly in the mountains and is common on the easterly slopes of the Sierra Nevada. Early spring. Positive: C., R.

45. BRIZA MINOR. Annual Quaking-grass. Grass Fam. Fairly common from middle Calif. northward; important in the Sacramento Val. and in the towns of the north coast district. April–July. Positive: C.

*46. BROMUS CARINATUS (including *B. marginatus*). Bromegrass. Grass Fam. Coastal counties and at middle altitudes in the mountains; almost absent from hot interior valleys; seldom abundant but pollinates profusely; rather common around San Bernardino, Los Angeles, Pasadena, Ukiah, Eureka, and the cities on San Francisco Bay. March–May, and to June in the northwest. Positive: C,. R., Se.

*47. BROMUS HORDEACEUS (=*B. mollis*). Soft Chess. Cheat. Grass Fam. The most abundant grass in the Coast Ranges; introduced from Europe; common near most towns throughout the State. Often called "Poverty-grass." Spring. Positive: R., Sc., Se.

48. BROMUS RUBENS. Red Brome. Grass Fam. An abundant grass of southern Calif. and common in warm vals. as far north as Redding; occasional around San Francisco Bay. February–April. Positive: P.

*49. BROMUS TECTORUM. Downy Bromegrass. Grass Fam. One of the most abundant of introduced grasses in the Western States, especially Nevada, and now getting established in Calif.; will be restricted to dry soil. Now grows at Ontario, Santa Barbara, Yosemite, Truckee River Val., Sisson, and Yreka. Early spring. Positive; Sc., Se.

50. BROMUS UNIOLOIDES. Rescuegrass. Grass Fam. Common in towns of southern Calif.—even on the desert, where irrigated—and in Owens Val.; less plentiful as far north as Palo Alto, Bakersfield, and Bishop, sometimes as a cultivated grass, often as a weed in warm, moist places. Summer.

*51. BROMUS VILLOSUS (=*B. maximus*). Broncho grass. Grass Fam. Abundant throughout the State; occupies vacant lots and other waste places in all the cities. Apparently one of the worst hay-fever grasses. Spring, especially May–June. Positive: C., P., R., Se.

52. CAREX, species. Sedge. Sedge Fam. There are many species of Carex, a few of them common in moist places, especially mountain meadows, and all are wind-pollinated. However, but two positive reactions have been reported (Se., C.) and it is probable that none is of much importance. They are grasslike in appearance and belong to a family related to the grasses.

53. CANNABIS SATIVA. Hemp. Mulberry Fam. Cultivated abundantly in lower parts of San Joaquin and Sacramento Vals., especially near Stockton; occasionally found elsewhere. Summer.

54. CARYA PECAN. Pecan. Walnut Fam. Occasionally grown in yards and orchards, especially in the Sacramento and San Joaquin Vals., and as a shade tree at Santa Barbara. Spring.

55. CASTANEA CHRYSOPHYLLA. Giant Chinquapin. Beech Fam. Only in the Coast ranges from Monterey Co., northward. Summer.

56. CASTANEA SATIVA. Chestnut. Beech Fam. Grown in some districts for its nuts. Summer.

57. CASTANEA SEMPERVIRENS. Bush Chinquapin. Beech Fam. Only in the mountain above 3,000 feet. Summer, especially July–August.

58. CELTIS OCCIDENTALIS. Hackberry. Elm Fam. Grown as a street tree in Los Angeles and perhaps elsewhere. Other species are occasionally seen in yards. Early spring. Positive: Sc.

59. CENCHRUS PAUCIFLORUS (=*C. tribuloides*). Sandbur. Grass Fam. Only in hot sandy places of the San Joaquin Val. and southern Calif.; apparently nowhere abundant except around Bakersfield. Spring, summer.

*60. CHENOPODIUM ALBUM. Lambs-quarters. Pigweed. White Goosefoot. Chenopod Fam. Common around all towns, occasionally in sufficiently large masses to be important. June–October. Positive: C., P., Ro., Sc., Se.

61. CHENOPODIUM AMBROSIOIDES. Mexican Tea. Chenopod Fam. A weed of neglected fields and near salt marshes or streams. West Berkeley, San Joaquin Val., etc. The Wormseed (*C. anthelminticum*) is a closely related and very similar species, or variety. June–December. Positive: Sc.

62. CHENOPODIUM BOTRYS. Jerusalem Oak. Chenopod Fam. All over the State, but seldom abundant. June–October. Positive: Sc.

63. CHENOPODIUM CALIFORNICUM. Soaproot. Chenopod Fam. Only on moist slopes or in swales or streamways in the foothills. Throughout the State, but not abundant. March–May.

64. CHENOPODIUM LEPTOPHYLLUM. Chenopod Fam. An occasional weed in fields, especially in the San Joaquin Val. Summer, autumn.

65. CHENOPODIUM MURALE. Nettleleaf Goosefoot. Chenopod Fam. Very closely related to *C. album* and the same notes apply, but the plant is less common.

66. CORYLUS ROSTRATA. Hazelnut. Beech Fam. A common bush in the foothills from Santa Barbara and Tulare Cos. north. Usually too remote from towns to be a menace. The western variety (var. *californica*) is but very slightly different from the common hazelnut of the Eastern United States. January–April. Positive: R.

*67. CYNODON DACTYLON. Bermuda grass. Grass Fam. An abundant grass on low, moist lands, especially where slightly alkaline, in all the warmer parts of the State; Sacramento Val. to Berkeley and the southern borders; common around Sacramento, Stockton, Fresno, and Bakersfield, and in Imperial Val. May–October. Positive: Sc., Se.

*68. DACTYLIS GLOMERATA. Orchard grass. Grass Fam. Throughout the State, especially in meadows and pastures of the north and extending through Oregon and Washington; occasionally near towns from San Diego north. Apparently one of the most active of grass pollens. March–August. Positive: C., P. R., Sc., Se., W.

69. DANTHONIA CALIFORNICA. Danthonia. Grass Fam. A common native grass on dry hills of the Coast Ranges from San Luis Obispo north. Spring.

70. DATISCA GLOMERATA. Durango-root. Datisca Fam. Moist places in canyons; not common. Spring.

71. DICORIA CANESCENS. Dicoria. Composite Fam. Restricted to the deserts; Inyo Co. to Palm Springs and eastward. June–November.

72. DIGITARIA SANGUINALIS (=*Panicum sanguinale*=*Syntherisma sanguinale*). Crabgrass. Grass Fam. Along ditches and on low moist land in the warmer districts. July–October. Positive: Sc.

*73. DISTICHLIS SPICATA. Saltgrass. Grass Fam. Abundant on low land, both in the alkaline interior valleys and in saline soil along coast, throughout the State; especially important in San Joaquin Val. towns. Summer and autumn. Positive: P., Sc., Se.

*74. DONDIA FRUTICOSA (=*Suaeda* species). Sea-Blite. Alkali-Blite. Chenopod Fam. Abundant in alkaline districts of the interior and in saline soil along the coast; San Francisco and Humboldt Bays, San Joaquin Val., Perris Val., etc. There are several closely related forms sometimes treated as distinct species. April–October. Positive: P.

*75. ECHINOCHLOA CRUS-GALLI (=*Panicum Crus-galli*). Barnyard grass. Grass Fam. In all the warmer districts on moist lands and along ditches. The most abundant weed in rice fields. July–November. Positive: Sc.

76. ELEOCHARIS PALUSTRIS. Common Spike-rush. Sedge Fam. Abundant in wet or marshy places, especially in the warmer districts, but belongs to a family supposedly innocent. May–June.

*77. ELYMUS CONDENSATUS. Giant Wild-rye. Grass Fam. A very coarse grass, growing in large clumps in somewhat moist places throughout Calif.; usually not in towns, but sometimes in natural parks (e. g., Griffith Park, Los Angeles) and around resorts. June–September. Positive: C., Sc., Se.

*78. ELYMUS GLAUCUS. Glaucous Wild-rye. Western Ryegrass. Grass Fam. Frequent in the coast counties from San Luis Obispo north; also in northeastern Calif. and the Sierra Nevada; scarce in southern Calif., except in the mountains. May–July. Positive: P., Se.

79. ELYMUS SITANION (=*Sitanion* species). Grass Fam. In dry, warm places, especially along railroads and in the hills where not disturbed. The latest authorities recognize *Sitanion* as a genus distinct from Elymus, and credit it with six species from Calif. It is probable that the pollen of all is of uniform chemical composition. May–July. Positive: Se.

*80. ELYMUS TRITICOIDES. Slender Wild-rye. Grass Fam. Common on low or moderately alkaline ground, especially toward the coast in southern Calif., but also at such places as Lancaster, Bakersfield, San Jose, Napa Val., Yreka, Honey Lake Val., etc. May–July. Positive: R., Se.

81. EPHEDRA, species. Desert Tea. Mountain Tea. Gnetum Fam. Chiefly of the desert borders but westerly through Tejon and Tehachapi passes a short distance. Pollen peculiar and perhaps not a cause of hay fever. April–July.

82. ERAGROSTIS, species. Grass Fam. About eight species occur within the State, some of which, such as *E. pilosa* and *E. lugens*, should perhaps be considered, at least in the south, but none is very abundant. Early spring. Positive: R., Sc.

83. EUROTIA LANATA. Winterfat. Chenopod Fam. Only on the desert, but there common; extends sparingly through Tehachapi Pass to San Luis Obispo Co. Erroneously called "White Sage." Spring, summer.

*84. FESTUCA MICROSTACHYS. Grass Fam. Common in the coast counties of northern and middle Calif.; only occasional in the south and in the interior. The species has been broken up by some into several, the characters used being such as to indicate that the resulting segregates probably need not be taken into account as far as the pollen is concerned. The most common of the proposed segregate species are *F. pacifica* and *F. reflexa*. Early spring. Positive: Sc.

*85. FESTUCA MYUROS. Grass Fam. One of the most abundant grasses everywhere except on the deserts; especially important on the coastal slope; occupies vacant lots in towns. Here taken to include *F. bromoides* and *F. megalura;* the three forms are so closely related that they can not be satisfactorily distinguished, even by experts. Early spring. Positive: R.

86. FRANSERIA ACANTHICARPA (=*Gaertneria acanthicarpa*). False Ragweed. Composite Fam. Common in southern Calif. and east of the Sierra Nevada, in warm, sandy soil. August–December (see Pub. Health Repts. *32:* 1147, Fig. 10. 1917). August–September. Positive: Sc.

87. FRANSERIA BIPINNATIFIDA (=*Gaertneria bipinnatifida*). Composite Fam. Only along the seashore, but for the full length of the State. April–December. Positive; Sc.

88. FRANSERIA CHAMISSONIS (=*Gaertneria chamissonis*). Composite Fam. Only along the seashore from middle Calif. northward and on the islands off Southern Calif. Very closely related to *F. bipinnatifida*. August–September. Positive: Sc.

89. FRANSERIA DUMOSA (=*Gaertneria dumosa*). Composite Fam. Very abundant on the hot, dry deserts, but not west of the mountains; important along the railroads crossing both the Mohave and Colorado deserts. March–June. Positive: Sc.

90. FRANSERIA TENUIFOLIA (=*Gaertneria tenuifolia*). Composite Fam. Southern Calif. and eastward; usually not common; dry plains near Los Angeles, San Bernardino, San Jacinto, etc. Late summer and autumn. Positive: Sc., W.

91. FRAXINUS DIPETALA. Flowering Ash. Olive Fam. Hillsides in the foothills; not common near the larger towns. Early spring.

92. FRAXINUS OREGONA. Oregon Ash. Olive Fam. Along val. and foothill streams throughout the State; confined to the mountains in the south. Early spring.

Gaertneria. See *Franseria*.

93. GARRYA ELLIPTICA. Silk-tassel bush. Dogwood Fam. This is the most common of several Garryas, all shrubs of the foothills. None has been tested. February.

94. GASTRIDIUM VENTRICOSUM. Nitgrass. Grass Fam. A small but abundant grass at middle and lower altitudes everywhere except on the desert. May–September.

95. GRAYIA SPINOSA. Chenopod Fam. Mohave Desert and northward east of the Sierra Nevada; especially common around Owens Val. Probably mild. Spring.

Holcus halepensis. See *Andropogon sorghum* var. *halapense*.

*96. HOLCUS LANATUS (=*Notholcus lanatus*). Velvet grass. Grass Fam. An abundant meadow and pasture grass in the north Coast Ranges and Sierra Nevada; absent from the hot interior and southern valleys. Summer–autumn. Positive: C., R., Sc., Se.

97. HORDEUM GUSSONEANUM (=*H. maritimum* var. *gussoneanum*). Very similar to No. 98, but the spikes usually smaller and the glumes not ciliate; much less common but sometimes plentiful, especially on heavy clay soil. Spring.

98. HORDEUM MURINUM. Wall Barleygrass. Grass Fam. Abundant annual in all parts of the State except the mountains and desert; often forms solid stands on vacant

lots and along roadsides as well as in fields. Commonly called "fox-tail," but this name is also used for several other grasses. Spring, especially March–May. Positive: P., R., Sc., Se.

99. HORDEUM NODOSUM. Meadow Barleygrass. Grass Fam. Widely spread but not so abundant as the other species; particularly common in meadows and on low, level land. Spring, summer.

100. HORDEUM VULGARE. Barley. Grass Fam. A common crop in all parts of the State except the mountains and desert. Spring. Positive: Sc.

*101. HUMULUS LUPULUS. Hops. Mulberry Fam. A common cultivated crop in certain interior valleys of northern Calif., especially in Sonoma and Lake Cos. and around Sacramento. June.

102. HYMENOCLEA MONOGYRA. Composite Fam. Very closely related to No. 103. Only along the southern borders of the State from San Diego (common in Mission Val.) east.

*103. HYMENOCLEA SALSOLA. Composite Fam. Chiefly of the desert, where common on the lower hills; on the coastal slope only near Bakersfield and Cuyama, the latter in Santa Barbara Co. Positive: Sc.

*104. IVA AXILLARIS. Poverty weed. Composite Fam. Low land throughout the State. Related to the ragweeds and important in the districts where it occurs. Pollen abundant and easily secured. July–September. Positive: R., Sc., Se.

105. IVA HAYESIANA. Composite Fam. Restricted to western San Diego Co. and Lower Calif.

*106. JUGLANS CALIFORNICA (including var. *hindsi*). California Black Walnut. Walnut Fam. Much grown as a shade and ornamental tree in the Sacramento, Napa, and Russian River Vals.; here the most frequent cause of spring hay fever; less common in the San Joaquin Val. and the south Coast Ranges; occurs native especially at Walnut Creek and in the coastal canyons of southern Calif. from the Santa Ana Mountains north; common in the hills back of Los Angeles and Santa Monica, often near suburban homes. The southern form is var. *hindsi*, but the pollen probably reacts nterchangeably with the northern form. Pollen produced in great abundance but not carried far from the trees. Positive and virulent. April, May, and perhaps early June. Positive: R., Sc., Se., W.

107. JUGLANS REGIA. Persian or English Walnut. Walnut Fam. Possesses the botanical features of a hay-fever plant but no cases have been reported. Early spring.

108. JUNCUS, species. Rush. Rush Fam. There are many species of Juncus in Calif., but as yet none has been found to cause hay fever. Some are abundant in salt marshes along the coast, others in mountain meadows, and some along streams. They are grass-like in appearance, although not very closely related to the grasses.

109. KOCHIA AMERICANA (including *K. californica* and *K. vestita*). Chenopod Fam. In strong alkali only; San Joaquin Val. from Madera Co. south; east of the Sierra Nevada from Antelope Val. and Mohave Desert to Oregon.

*110. LAMARCKIA AUREA (=*Achyrodes aureum*). Goldentop. Grass Fam. Abundant in southern Calif., less common northward to San Jose; absent or rare in the San Francisco Bay district and other places along the coast. Spring.

*111. LOLIUM PERENNE. Ryegrass. Raygrass. Grass Fam. One of the most common of pasture and lawn grasses, running wild in districts of moderate or copious rainfall; most important from San Francisco northward and in Oregon. Several varieties are represented. Spring, summer, especially May–June. Positive: C., P., R., Sc., Se.

112. LOLIUM TEMULENTUM. Darnel. Grass Fam. A very distinct species from Raygrass; larger and with more flowers, but fortunately much less common. Orchards and fields of the warmer districts. Spring, summer.

113. MELICA IMPERFECTA. Slender Melicgrass. Grass Fam. Open woods and rocky hillsides; common in the Coast Ranges from the San Francisco Bay district south to San Diego; only scattering in the Sierra Nevada foothills. April, May.

114. MELICA TORREYANA. Torrey Melicgrass. Grass Fam. Middle Calif. from the Sierra foothills to the coast, where plentiful on hillsides. April, May.

115. MELICA, species. About 11 species of less importance also occur.

116. MORUS ALBA. White Mulberry. Mulberry Fam. This and a few other species, especially *M. nigra*, the Black Mulberry, are grown to a limited extent near towns. Probably never a cause of hay fever. Spring, summer.

*117. ORYZA SATIVA. Rice. Grass Fam. Grown almost throughout the Sacramento Val. and at a few places in the San Joaquin, for example, near Oakdale; absent from the coast and from southern Calif. August–September. Positive: Sc.

118. ORYZOPSIS HYMENOIDES (=*O. membranacea* and *Eriocoma cuspidata*). Sandgrass. Grass Fam. Deserts of southern Calif. north to Owens Val. Oregon, etc.

119. PANICUM MILIACEUM. Broomcorn Millet. Grass Fam. Cultivated in the warm interior valleys. Positive: R.

120. PANICUM PACIFICUM. Grass Fam. Moist shores and rock crevices in the foothills.

Panicum. See also *Digitatia* and *Echinochloa.*

121. PASPALUM DISTICHUM. Knotgrass. Grass Fam. Common in low moist land, throughout the State; Riverside, San Joaquin Val., Stockton, Sacramento, and Humboldt and Del Norte coasts. A low grasslike Bermuda grass, but stouter and usually with only two spikes to each inflorescence. Summer, autumn.

122. PENNISETUM RUPPELLI. Crimson Fountaingrass. Grass Fam. In gardens and along borders of parks; Berkeley, Santa Barbara, Los Angeles, San Diego, etc. Spring, summer. *Pennisetum villosum* is also grown as an ornamental grass.

*123. PHALARIS CANARIENSIS. Canarygrass. Grass Fam. An introduced grass, occasionally common in northern and coast cos.; Yreka, Berkeley, near San Jose, Monterey, Santa Catalina Island, San Diego, April–July. Positive: R., Sc.

124. PHALARIS MINOR. Small Canarygrass. Grass Fam. Occasional patches of this vigorous grass are found in the hot interior valleys, in southern Calif., and also along the coast. April–June. Positive: Se.

125. PHALARIS PARADOXA. Gnawed Canarygrass. Grass Fam. Interior valleys and coastal districts, especially on heavy clay soils; rare in southern Calif. April–June.

*126. PHLEUM PRATENSE. Timothy. Grass Fam. Much grown for hay and pasturage in the northern and mountain counties; very important there and in Oregon and Washington; occurs in the warm interior valleys and in southern Calif., only as scattered introductions of no consequence. One of the most frequently reported causes in northern districts. June–August. Positive: C., P., R., Sc., Se.

127. PHOENIX DACTYLIFERA. Date Palm. Palm Fam. A small proportion of staminate trees are grown in the orchards of Coachella and Imperial Vals. Palms of numerous species are grown in Calif. for ornamental purposes but they seldom flower. Spring. Positive: P.

128. PHORADENCHRON FLAVESCENS (including vars. *macrophyllum* and *villosum*). Mistletoe. Mistletoe Fam. This is the common broad-leafed mistletoe on oaks, cottonwoods, sycamores, etc. There are several less common species. None is definitely known to cause hay fever.

129. PISTACIA VERA. Pistache. Sumach Fam. Cultivated sparingly in warm parts of the State. April–May.

*130. PLANTAGO LANCEOLATA. English Plantain. Plantago Fam. Occurs from southern Calif. north but of importance only in the more moist districts, such as the San Francisco Bay region and the north coast counties. Of first rank in Oregon and Washington. April–August. Positive: C., Sc., Se.

131. PLANTAGO MAJOR. Common Plantain. Plantago Fam. Only on low, moist land; nowhere abundant. April-October. Positive: Sc., Se.

132. PLANTAGO PATAGONICA. Plantago Fam. Very common on warm hillsides everywhere. Spring.

*133. PLATANUS ORIENTALIS. Oriental Plane or Sycamore. Plane Fam. A street and park tree. Common in cities; Sacramento, Oakland, San Jose. February–April. Positive: Se.

134. PLATANUS RACEMOSA. California Sycamore. Plane Fam. Along streams, usually remote from towns but in the suburbs of Los Angeles, Pasadena, etc. February–April.

135. PLEURAPHIS RIGIDA (=*Hilaria rigida*). Galleta grass. Grass Fam. Mohave and Colorado Deserts only. Pollination follows desert rains.

136. POA ANNUA. Walkgrass. Grass Fam. A small weed found in nearly all towns, yet not forming an extensive growth, common in lawns. Spring, summer. Positive: R., Sc., W.

*137. POA PRATENSIS. Kentucky bluegrass. Grass Fam. Much used in the north for pasture and hay and throughout the State as a lawn grass. One of the plants called "June-grass" in Eastern States. Spring, summer, autumn. Positive: C., P., Sc., W.

138. POA, species. Nearly 30 other Poas grow within Calif., but their classification is not well worked out. Aside from the two here listed, none is very common except in the mountains and in the northern counties. Positive: R., Sc., Se.

139. POLYPOGON LITTORALIS. Water Beardgrass. Grass Fam. Common in moist places, as along ditches; less common than No. 140. April–September.

*140. POLYPOGON MONSPELIENSIS. Tawny Beardgrass. Grass Fam. Common in moist places, as along ditches and in river bottoms throughout the State, even skirting streams in the desert mountains. April–September.

141. POPULUS FREMONTI. Fremont Cottonwood. Willow Fam. The common cottonwood of river bottoms and canyons from Lake Co. south. Early spring. Positive: R.

142. POPULUS, species. Various other species are grown as ornamental trees and may be an occasional cause of hay fever in the early spring. *P. tremuloides* is the Quaking Aspen of the Sierra Nevada.

143. QUERCUS AGRIFOLIA. Coast Live Oak. Beech Fam. Coastal districts only, from San Diego to Mendocino; abundant around San Francisco Bay, but not common farther northward. Pollen abundant but potential area perhaps restricted. Spring. Positive: P., R.

144. QUERCUS DENSIFLORA (=*Pasania densiflora*). Tanbark oak. Beech Fam. Abundant in the Coast Range Mountains from Monterey Co. north. Summer.

145. QUERCUS DUMOSA. Scrub oak. Beech Fam. Abundant in the foothills throughout the State. Important only to those living in the mountains or in suburbs among the hills. Spring. Positive: Sc., H.

146. QUERCUS LOBATA. Valley Oak. Beech Fam. A tree of the plains. Sacramento, San Joaquin, and Santa Clara Vals., also in smaller valleys of the Coast Ranges, but almost excluded from southern Calif. Early spring.

147. QUERCUS, species. Various additional oaks occur, especially in the mountains, but are relatively unimportant. The commonest species are the California Black Oak (*Q. kelloggi*), the Maul Oak (*Q. chrysolepis*), and the Huckleberry Oak (*Q. vaccinifolia*).

148. RAZOUMOFSKYA OCCIDENTALIS (=*Arceuthobium occidentale*). Pine Mistletoe. Mistletoe Fam. Foothills and mountains on Yellow and Digger Pine. Not positively known to cause hay fever. Late summer.

149. RUMEX ACETOSELLA. Sheep Sorrel. Buckwheat Fam. Common as a weed in lawns and fields. Mostly May-Oct., but often pollinating out of season. Mild. Positive: C., P., R., Sc.

150. RUMEX CONGLOMERATUS. Green Dock. Buckwheat Fam. Low, moist lands throughout the State and up to middle altitudes in the mountains. March-June. Mild. Positive: R., Sc.

151. RUMEX CRISPUS. Curly Dock. Buckwheat Fam. A common weed on low lands and in the mountains to middle altitudes. March-June. Mild. Positive: Sc., Se.

152. RUMEX HYMENOSEPALUS. Canaigre. Buckwheat Fam. Dry sand washes and sandy plains from Kern Co. and Nipomo southward. Formerly abundant in the San Fernando Val. and from Los Angeles to San Bernardino, but now largely crowded out by orchards. Early spring.

153. RUMEX PULCHER. Fiddle Dock. Buckwheat Fam. Common in waste places. Spring.

154. RUMEX SALICIFOLIUS. Willow Dock. Buckwheat Fam. Wet places in valley and mountains. Spring, summer. Mild.

155. RUMEX, species. Additional species but much less common or local are *R. berlandieri* (Imperial Val. only), *R. obtusifolius* (about San Francisco Bay), *R. paucifolius* (only in the mountains), *R. persicarioides* (wet places throughout), and *R. venosus* (only in the northeast, i. e., Honey Lake Val. and north).

156. SALICORNIA AMBIGUA. Pickleweed. Chenopod Fam. Alkaline flats of the interior and saline marshes along the coast; abundant. June-October. *S. subterminalis* is another species to be considered. It is closely related and ranges from Bakersfield south.

* 157. SALSOLA KALI. Russian Thistle. Chenopod Fam. Locally abundant at a few places in the Sacramento and San Joaquin vals., also at widely separated stations, but always where warm and dry; San Diego, Antelope Val., Bakersfield, San Luis Obispo, Gilroy, Tracy, Owens Val., etc. Apparently very important east of the Sierra Nevada and throughout the Great Basin States. Summer and early autumn. Positive: P., Sc., Se., W.

158. SARCOBATUS VERMICULATUS. True Greasewood. Chico. Chenopod Fam. A common green shrub of alkaline flats in the Great Basin, occurring west of the Sierra Nevada only in the San Joaquin Val., as far north as Byron. Not in southern Calif. Many other plants are erroneously called greasewood. May-August. Positive: P., Sc.

159. SECALE CEREALE. Rye. Grass Fam. Cultivated in northern Calif. and to a less extent in the middle and southern parts of the State. Spring. Positive: Sc.

160. SCIRPUS, species. Bulrush. Tule. Sedge Fam. These plants belong to a family related to the grasses, and the flowers are wind pollinated; yet they seem not to cause hay fever. The best known is the common Tule (*S. acutus*) of lowland marshes.

Sitanion. See *Elymus sitanion*.

161. SPARTINA FOLIOSA. Cordgrass. Grass Fam. San Francisco Bay to San Diego; only where reached by tidewater but there often forming pure stands. August-December.

162. SPIROSTACHYS OCCIDENTALIS (=*Allenrolfea occidentalis*). Iodine-bush. Kern Greasewood. Chenopod Fam. Abundant in the alkaline districts of the San Joaquin Val. Wanting elsewhere. Spring.

163. SPOROBOLUS AIROIDES. Alkali Sacaton. Grass Fam. In saline and alkaline soil, San Joaquin Val., Mohave and Colorado Deserts; rarely seen west of the mountains in southern Calif. May-September. Positive: Sc.

164. SPOROBOLUS ASPERIFOLIUS. Grass Fam. Common only on the desert and elsewhere east of the Sierra Nevada; local at a number of places from the upper San Joaquin Val. to Riverside and San Diego. June-September.

165. STIPA LEPIDA (=*S. eminens*). Dry hills throughout the State, but not so common as formerly. March-June.

166. STIPA PULCHRA (=*S. setigera*). Needlegrass. Grass Fam. Formerly abundant throughout the State, now confined mostly to railroad rights of way, cemeteries, and other protected areas. March-June.

167. STIPA, species. Twelve other species occur in the State but they are not abundant.

Suaeda. See *Dondia.*

168. TOXYLON POMIFERUM (= *Maclura pomifera*). Osage-orange. Mulberry Fam. Occasional as a hedge plant or roadside tree; relation to hay fever not known.

169. TRITICUM AESTIVUM (= *T. vulgare* and *T. sativum*). Wheat. Grass Fam. Cultivated in nearly all of the agricultural districts. Usually self-pollinated, but there are always a few plants in a field that throw out a small amount of pollen. Potential area limited by large size of pollen grains. Spring; harmless at time of harvesting for grain. Positive: Sc.

170. ULMUS, species. Elm. Elm Fam. Several species of Elm are grown as street trees and cause a mild form of very early hay fever. The possibility of using pollen from one species in testing and treating for the others has not been determined. Positive: Sc.

171. URTICA GRACILIS (= *U. holosericea*). Common Nettle. Nettle Fam. A weed along creeks and in river bottoms and other wild places; usually not common near towns. May–September.

172. URTICA URENS. Small Nettle. Nettle Fam. In neglected orchards and fields, often in towns, central and southern Calif. Spring, especially May.

173. XANTHIUM PENNSYLVANICUM (= *X. canadense* of some authors). Cocklebur. Composite Fam. On low, weedy ground, especially where moist, throughout the State. Potential area restricted by the large size of the pollen grains. May–September, possibly also earlier. Positive: Sc., Se.

174. XANTHIUM SPINOSUM. Spiny Clotbur. Composite Fam. At low altitudes in all of the warmer parts of the State. Potential area restricted by the large size of the pollen grains. June–October, possibly also earlier. Positive: Sc., Se.

175. ZEA MAYS. Maize. Indian Corn. Grass Fam. Cultivated to a limited extent. The pollen grains are so large that the potential area is restricted to the immediate vicinity of the cornfields. Workers are sometimes affected when the plants are in pollen. Season varies with cultural conditions; mostly summer, autumn. Positive: C., Sc., Se., W.

7. SUPPLEMENTARY LIST.

The plants enumerated in this supplementary list are believed not to be important or frequent causes of hay fever. They are all entomophilous and are here listed merely because of the popular belief that they are causative factors and some because of positive tests that have been obtained for them. The reasons for considering them innocent, except perhaps through direct inhalation, are stated above (p. 804), where also the apparently positive reactions occasionally met with are explained.

176. ACACIA, species. Pea Fam. Popularly supposed to be a cause of spring hay fever, but this is almost impossible except by direct inhalation. The pollen is produced very sparingly and is not easily carried by the wind.

177. CHRYSANTHEMUM LEUCANTHEMUM, and other species. Oxeye Daisy, Shasta Daisy, etc. Composite Fam. The large heads of flowers pollinate rather copiously for an entomophilous species, and the plants are much grown in Calif. gardens. Spring, summer, autumn. Positive: C., P., R., Sc.

178. CITRUS SINENSIS. Orange. Citrus Fam. Commonly reported as a cause of early hay fever, but this is impossible. Pollen scarce and heavy. The navel variety does not produce pollen. Most cases credited to orange are caused by spring grasses or by black walnut.

179. **ERIGERON CANADENSIS.** Horseweed. Composite Fam. A common weed in warm districts and along streets in towns. Summer. Positive: Sc.

180. **HELENIUM PUBERULUM.** Sneezeweed. Composite Fam. Moist canyons and bottom lands. Summer. Positive: P., Se.

181. **HELIANTHUS ANNUUS.** Sunflower. Composite Fam. Widely distributed in the warmer parts of the State.

182. **HETEROTHECA GRANDIFLORA.** Telegraph Plant. Composite Fam. Common in interior valleys and southern Calif. One positive reaction obtained by Selfridge, but the species has none of the qualities of a hay-fever plant. Summer, autumn.

183. **MADIA SATIVA.** Tarweed. Composite Fam. This and other sorts of tarweeds, such as species of *Hemizonia*, have entered into hay-fever lists, but are believed to have nothing to do with hay fever.

184. **MEDICAGO SATIVA.** Alfalfa. Pea Fam. Abundant in all agricultural districts; pollen carefully protected by the flower so that it can not escape into the air unless the flowers are dried and pulverized, as in the curing or baling of hay cut when in bloom. Winds blowing across a field do not carry alfalfa pollen. All seasons.

185. **ROBINIA PSEUDACACIA.** Locust. Pea Fam. Popularly supposed to be a cause of hay fever, but this absolutely impossible. Most cases reported due to locust are caused by black walnut or by spring grasses.

186. **ROSA**, species. Rose. Rose Fam. Roses produce but a small amount of pollen. This is especially true of cultivated roses. Positive reactions have been obtained in a few cases where roses bloomed in abundance around the patient's home, but the purity of the extracts used was not verified. Scheppegrell reports the influence of garden roses in hay fever as a "popular myth." The common wild species is *Rosa californica.*

187. **SALIX**, species. Willow. There are many species of willow in the State, and some have been admitted to hay-fever lists, but since the pollen is chiefly insect-carried they are doubtlessly of minor importance. Early spring. Positive: C., P., R., Sc.

188. **SAMBUCUS CAERULEA.** Elderberry. Honeysuckle Fam. A common shrub in rural districts; sometimes accused, but the pollen is heavy and very sparse.

189. **SOLIDAGO CALIFORNICA.** California Goldenrod. Composite Fam. Scattering throughout the State, especially in the foothills; not so common as goldenrods in the Eastern States. Believed to be of no importance. Summer, autumn. Positive: Se.

190. **TANACETUM CAMPHORATUM.** Dune Tansy. Composite Fam. Restricted to beach sands from middle Calif. north. *T. vulgare* is occasionally grown in gardens. August–November.

8. DISTRICT LISTS.

In the following lists only those plant species are enumerated that are known to occur in abundance in the respective districts. It should be remembered that these numbers are presented only as a suggestion of the pollens to which attention should first be given. It is probable that others of the main list will be found to be more important than some of those here indicated, and it is not unlikely that some species entirely overlooked will be of considerable importance in some districts. The numbers refer to the entries in the main list.

(*A*) *San Francisco Bay communities.*

11	12	14	20	21	27	36	40	41	42	45	46	47
51	60	61	66	67	68	73	74	75	80	84	85	94
96	98	100	104	106	111	123	130	133	136	137	143	146
149	150	151	153	156								

(*B*) *Sacramento and San Joaquin valleys.*

3 10 11 12 15 16 17 20 27 29 30 31 35
36 37 38 40 41 42 45 46 47 48 49 51 53
54 59 60 61 64 67 68 72 73 74 75 80 85
94 98 99 100 101 104 106 109 110 111 114 117 119
121 123 133 137 140 146 156 157 158 162 169 174 175

(*C*) *Los Angeles-Pasadena district.*

5 10 11 12 15 16 20 21 23 27 30 31 38
40 41 46 47 48 49 50 51 60 61 67 68 72
73 74 75 77 80 85 86 90 94 98 99 100 104
106 110 111 112 113 114 121 124 130 131 132 133 134
137 140 143 145 150 151 153 156

9. INDEX TO COMMON NAMES.

Acacia, 176.
Alder:
  Red, 8.
  White, 9
Alfalfa, 184.
Alkali Blite, 74.
Allscale, 37.
Ash:
  Flowering, 91.
  Oregon, 92.
Barley, 100.
Barleygrass, 98, 99.
Barnyard grass, 75.
Beachgrass, 14.
Beardgrass:
  Tawny, 140.
  Water, 139.
Beet, 43.
Bermuda-grass, 67.
Birch, 44.
Bluegrass, 137.
Bractscale, 31.
Brome, Red, 48.
Bromegrass, 46.
  Downy, 49.
  Red, 48.
Broncho grass, 51.
Bud-sage, 25.
Bulrush, 160.
Canaigre, 152.
Canarygrass, 123-125.
Cheat, 47.
Chess, 47.
Chestnut, 56.
Chico, 158.
Chinquapin, 55-57.
Clothbur, Spiny, 174.
Cocklebur, 173.
Cord-grass, 161.
Corn:
  Egyptian, 17.
  Indian, 175.
  Kaffir, 17.
Cottonwood, 141.
Crabgrass, 72.
Daisy, 177.
Danthonia, 69.
Darnel, 112.
Dicoria, 71.
Dock:
  Curly, 151.
  Fiddle, 153.
  Green, 150.
  Willow, 154.
Dragon sage, 23.
Durango-root, 70.
Elderberry, 188.
Elm, 170.
Fat-hen, 36.
Fescue-grass, 84, 85.
Fountaingrass, 122.
Gaillcta-grass, 135.
Goldenrod, 189.
Golden-top, 110.
Goosefoot:
  Nettle-leaf, 65.
  White, 60.
Greasewood:
  Kern, 162.
  True, 158.
Hackberry, 58.
Hairgrass, 7.
Hazelnut, 66.
Hemp, 53.
Holly, Desert, 35.
Hops, 101.
Horseweed, 179.
Indian Hair Tonic, 23.
Iodine bush, 162.
Johnson grass, 15.
June grass, 137.
Knotgrass, 121.
Lambs Quarters, 60.
Lemon, 178.
Lenscale, 35.
Locust, 185.
Lucerne, 184.
Maize, 175.
  Milo, 17.
Meliegrass:
  Slender, 113.
  Torrey, 114.
Millet, 119.
Mistletoe, 128.
  Pine, 148.
Mugwort, 27.
Mulberry, 116.
Needle grass, 166.
Nettle:
  Common, 171.
  Small, 172.
Nitgrass, 94.
Oak:
  Coast Live, 143.
  Jerusalem, 62.
  Scrub, 145.
  Tanbark, 144.
  Valley, 146.
Oat, 40-42.
Old Man, 21.
Orache, Red, 38.
Orange, 178.
Orchard grass, 68.
Osage-orange, 168.
Palm, 127.
Panic-grass, 120.
Pecan, 54.
Pickleweed, 156.
Pigweed, 60.
  Rough, 11.
Pistache, 129.
Plane Tree, 133, 134.
Plantain:
  Common, 131.
  English, 130.
Poverty-weed, 104.
Quailbrush, 35.
Quaking-grass, 45.
Ragweed:
  Dwarf, 13.
  False, 86.
  Western, 12.
Raygrass, 111.
Redscale, 38.
Redtop, 3
Reed, Giant, 29.
Rescuegrass, 50.
Ribwort, 130.
Rice, 117.
Rose, 186.
Rush, 108.
Rye, 159.
Ryegrass, 111.
Saccaton, Alkali, 163.
Sagebrush, 26.
  Coastal, 21.
  Hoary, 22.
Sagewort, 27.
Saltbush, 30, 31, 33, 39.
Saltgrass, 73.
  Fine-top, 163.
  Rough-leaf, 164.
Sandbur, 59.
Sandgrass, 118.
Sea Blite, 74.
Sedge, 52.
Shad-scale, 33.
Silk-tassel bush, 93.
Silverscale, 30.
Sitanion, 79.
Sneezeweed, 180.
Soaproot, 63.
Sorrel, Sheep, 149.
Spearscale, 36.
Spike-rush, Common, 76.
Spikeweed, 183.
Spinach, Cattle, 37.
Sudan grass, 16.
Sunflower, 181.
Sycamore:
  Native, 134.
  Oriental, 133.
Tansy, 190.
Tarweed, 183.
Tea:
  Desert, 81.
  Mexican, 61.
  Mountain, 81.
Telegraph Plant, 182.
Thistle, Russian, 157.
Timothy, 126.
Triple-awn grass, 19.
Tule, 160.
Tumbleweed, 10.
Velvet grass, 96.
Vernal grass, 18.
Walkgrass, 136.
Walnut, 106, 107.
Wheat, 169.
Wheatgrass, 1, 2.
Wild-rye, 77, 78, 80.
Willow, 187.
Winterfat, 83.
Wormwood, Biennial, 20.